Satellite Observations of the Global Water Cycle
Program Content

Opening Remarks:
Welcome from Local Organizing Committee

Session: Global Water Cycle

This session will provide an overview of our current understanding of the stocks and fluxes of the global water cycle and how remote sensing can be used to characterize their variability and trends. Poster submissions are encouraged that address how observations, model results and remote sensing can be utilized to quantify and understand water mass changes and redistribution amongst the land, ocean, atmosphere and ice components of the Earth system.
Key points for presentations, posters and discussion may include:

- How well do we really know the major storage and flux terms in the global water budget?
- Are there any 'missing sinks'?
- How can remote sensing help to minimize uncertainties?
- Do we have enough remote and ground based observations to observe accelerations in the water cycle?

1. Global Water Budget Estimates and Uncertainties — Kevin Trenberth *(NCAR)*
   - *Global budget and uncertainties*
   - *Trends and anticipated changes*
   - *Elements of a global water cycle observing system*

2. Ocean Mass Changes — Don Chambers *(U Texas)*
   - *Ocean mass changes as an integrator of the global water cycle*
   - *Implications for land and ice contributions and seasonal exchanges*
   - *Key unknowns and how they can be addressed using remote sensing*

3. Cryospheric Change and Uncertainties — Eric Rignot *(JPL)*
   - *Ice sheet mass balances and key uncertainties*
   - *Glaciers, snow, permafrost*
   - *Opportunities and challenges for multi-sensor approaches*

Session: Atmospheric Hydrometeorology

This session will provide an overview of our current understanding and challenges associated with the atmospheric component of the global water cycle. Poster submissions are encouraged that address how observations, models and remote sensing and data assimilation in particular can be utilized to characterize and simulate/predict atmospheric variability in water vapor, clouds and precipitation, as well as their connection to the surface.
Key points for presentations, posters and discussion may include:

- How well are we characterizing precipitation with our current suite of instrumentation and methods?
- What are the most important and most tractable problems in regards to quantifying and understanding the role of clouds in the global water cycle?
- How well are we characterizing the distribution and transport of water vapor, particularly in regards to its vertical structure and remotely-sensed values over land.
- What aspects of the atmospheric component of the hydrological cycle will be aided by data assimilation efforts and what are the needs and strategies associated with these efforts?

1. Precipitation — Chris Kummerow *(CSU)*
   - *Challenges in rainfall and snowfall estimation*

- *Characterizing variability and extremes rather than monthly means*
- *Multi-sensor strategies*

2. Clouds — Graeme Stephens *(CSU)*
   - *Estimates of cloud liquid and ice content*
   - *Sampling and measurement challenges, including trend detection*
   - *Recent satellite developments/contributions (e.g., A-Train)*

3. Data Assimilation of Hydrology Information — Mike Bosilovich *(GSFC)*
   - *Challenges and benefits of assimilating hydrology information*
   - *Impacts on water vapor transport, precipitation recycling*
   - *Model-Data Interface: What do we still need to yield from observations; what will we necessarily need to rely on from models?*

Session: Terrestrial Hydrology

This session addresses variability and trends in the land surface water balance, including storages (liquid and frozen), precipitation, evapotranspiration, and river discharge. Poster submissions are encouraged that address the contributions of remote sensing observations to understanding storage and flux processes across spatial and temporal scales, integration of observations and land hydrologic models, and improvement of surface-atmosphere parameterization schemes for weather and climate prediction models.
Key points for presentations, posters and discussion include:

- How well can we characterize variability of land water storages and fluxes? What satellite capabilities are needed to reduce the uncertainties?
- How can satellite observations of land hydrologic variables be used to monitor and predict extreme events (severe storms, floods and droughts) and their intensification?
- How can remotely sensed data improve representations of governing processes coupling the land hydrology to the atmospheric boundary layer and general circulation?

1. Remote Sensing of Terrestrial Hydrology — Eric Wood *(Princeton)*
   - *Remote sensing contributions to surface water balance*
   - *Problems in quantification of surface water, snow, and river discharge*
   - *Integration of remotely sensed observations in hydrologic models*

2. Hydroclimatology of Terrestrial Water Storage — Jay Famiglietti *(UCI)*
   - *Variations in total water storage*
   - *Remote sensing of groundwater*
   - *Connections between deep water and surface water variability and climate*

3. Evapotranspiration — Matt Rodell *(GSFC)*
   - *Approaches and challenges in deriving ET*
   - *Contributions of remote sensing*
   - *Improvements in representation of moisture fluxes in land surface models*

Session: Prediction Challenges
The purpose of this session is to review the status of hydrometeorology and hydroclimate predictions. Particular emphasis will be placed on the impact of remote sensing information on hydrologic prediction at various spatial and temporal scales. Key issues for presentations, posters and discussion may include:

- In what ways has remote sensing information filled (or can fill) the gaps in observations, parameterization and state estimates required by hydrologic forecasting models?
- What are the main challenges in taking full advantage of remote sensing data for hydrologic modeling purposes?
- How should we prioritize the remote sensing information most critical for hydrologic predictions?

1. Operational Hydrometeorology and Hydroclimate Predictions — Louis Uccellini *(NWS/NCEP)*
   - *Broad issues of hydrology prediction from an operational/national perspective*
   - *Status of hydrometeorology and hydroclimate verifications*
   - *Extent of use of remotely sensed information in hydrologic predictions*

2. Uncertainties in Prediction — Matthias Drusch *(ECMWF)*
   - *Soil/terrestrial impacts on prediction uncertainties*
   - *Quantification of precipitation estimation uncertainties*

3. Quantitative Precipitation Forecasting — Soroosh Sorooshian *(UCI)*
   - *Operational challenges in use of QPF*
   - *Role of remote sensing in improving QPF*

Session: Integrated Framework

(Global water cycle observation and assessment)

The focus of this session is on the connections between the applications of earth observations (broadly viewed) and remote sensing observations. Poster submissions are encouraged that address a variety of underlying questions related to the integrative challenges of remote sensing variables of the water cycle. Specific issues may include:

- In what ways can remote sensing offer a unifying perspective of the global water cycle, and further our understanding of Earth's climate
- Can remote sensing products help in environmental and water management, especially in areas of sparse in-situ data?
- What methods can be used with remotely sensed water cycle variables so as to have consistency in continental scale water budgets?

1. EOS/GEOSS Theme — Steve Running *(U Montana)*
   - *Integrated (synergistic) remote sensing for product generation*
   - *Contribution of remote sensing products to GEOSS*
   - *Role of Earth system data records*

2. Data Integration, Assimilation & Utilization — Paul Houser *(GMU)*
   - *Potential for assessing the 'water status' of continents as a monthly product*
   - *Elements include soil moisture, snow, precipitation, water vapor transport*
   - *Linkages with NIDIS, GEWEX, NEWS, others*

3. Water Resources/Management — Dennis Lettenmaier *(U Wash)*
   - *Role of remote sensing in nowcasting flood/drought*
   - *Forecasting skill*
   - *Challenges to making systems operational*

Session: Implications of the Decadal Survey and Future Directions

1. Implications of the Decadal Survey for Hydrology — Dennis Lettenmaier *(U Wash)*
   - *Outlook for water cycle missions and coordinating activities*

2. Grand Challenges — Dara Entekhabi *(MIT)*

3. Wrap-Up Discussion and Next Steps — Local Organizing Committee